

23 were canceled and claims 24-28 were added in a preliminary amendment filed with the application. The application was subject to a restriction requirement dated March 22, 2002 between four groups of claims, and a response thereto was filed on April 21, 2002 electing the subject matter of Group I, claims 1-11. Group II (claims 13-18), Group III (claims 20-21) and Group IV (claims 24-28) have been withdrawn from consideration. Claims 1-11 are currently pending.

The drawing is objected to with respect to labeling of the single figure. A corrected drawing wherein the figure is unlabeled, as required by the Office Action, is submitted herewith. It is believed that the objection is hereby overcome.

The abstract is objected to because the British form "characterised" and the legal term "said" are used. The Examiner's suggestion --characterized-- and --the-- is now adopted, and the abstract is now thus amended.

The disclosure is objected to because of informalities relating to references to the figure in the specification. The specification is now amended to recite "figure" where "Figure 1" formerly appeared. It is believed that the objection is hereby overcome.

#### **Rejections Under 35 U.S.C. § 112**

Claims 1-11 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The claims are now amended to more particularly point out and distinctly claim the subject matter which applicants regard as the invention, specifically addressing the issues raised by the Examiner. (Claim 1 is also amended to correct a typographical error in the claimed particle size range.) It is believed that the rejection is hereby overcome.

#### **Rejections Under 35 U.S.C. § 103(a)**

Claims 1-11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Heller (U.S. Patent No. 5,616,532) in view of Kimura (International Application WO 97/00134). The rejection is traversed.

Heller discloses a photocatalyst composition including a photocatalyst and a binder for adhering photocatalytic particles to a surface (col. 2, line 66 – col. 3, line 1). In example 14, a

composition containing titanium dioxide and a colloidal silica is described, but, as noted in the Office Action, specific surface area of the binder is not disclosed. In addition, while Heller recites 'colloidal silica' in that same example, an aqueous colloidal dispersion containing 20-50% silica is not disclosed.

Kimura relates to a two-layered photocatalyst-carrying structure, made up of an adhesive layer and a photocatalyst layer. The adhesive layer may include a 'colloidal silica-containing resin' while the photocatalyst layer is composed of a photocatalyst, a metal oxide or hydroxide gel, and a silicon compound (Abstract). Examples of silicon compounds for use in compositions containing a photocatalyst are exclusively alkoxysilanes (col. 8, line 64 – col. 9, line 20), and compositions containing a photocatalyst and a colloidal silica are not described. The Office Action states that Kimura discloses silica of 180 m<sup>2</sup>/g, and concludes that it would be obvious to use the silica of Kimura in the photocatalyst of Heller.

Applicants initially point out that both Heller and Kimura fail to disclose a composition containing a photocatalyzing agent and an aqueous colloidal dispersion having the claimed amount of silica. Therefore, the combination of the references would not result in the composition of the claims.

Applicants further submit that one of ordinary skill in the art would find no motivation or suggestion in either of the cited references to use a silica of the claimed specific area in Heller's composition. While Kimura does disclose a material having a specific surface area of 180 m<sup>2</sup>/g (col. 19, lines 31-33), this material is termed a 'silica sol' and cannot be considered a *colloidal* silica. Hence, one of ordinary skill in the art would have no motivation to use a *colloidal* silica of this specific surface area in Heller's composition. However, a second, and even more cogent, reason exists for why there is no motivation for one of ordinary skill in the art to use Kimura's silica in Heller's composition. This is because Kimura teaches away from using the material in a composition containing only a photocatalyst and the silica of the claimed specific surface area, in reference example 1 of Table 1. Experimental use of this composition as a coating on a primer-treated polyester film resulted in a material having extremely poor properties, as shown in Table 1 and described in col. 21, lines 31-37: "In this case, the photocatalyst layer has no sticking property and is easily defoliated. Furthermore, after a durability test, the surface of polyester film deteriorated due to a photocatalytic effect, and holes and cracks were observed on the film." Applicants submit that as a result of this teaching, one of ordinary skill in the art would

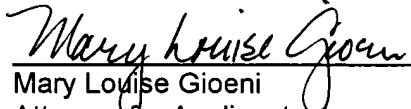
have no motivation to use any silica of the claimed specific surface area, based on Kimura's disclosure.

Therefore, based on the foregoing discussion, Applicants submit that claim 1 as amended is not obvious over the references; claims 2-11, which depend from and contain the limitations thereof, are likewise are not obvious over the references. It is believed that the rejection is hereby overcome.

Attached hereto is a marked up version of the changes made to claims 1, 2, 4, 5, 6, 7, 9 and 10. The attachment is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**" Also attached is copy of the Abstract of the Disclosure, on a separate sheet of paper, for the convenience of the Examiner.

Entry of the amendments and allowance of the pending claims is respectfully requested.

**Respectfully submitted,**

  
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VERSION WITH MARKINGS TO SHOW CHANGES MADE."

In the Specification:

Page 10 and 11: The last paragraph on page 10, beginning with line 34, through page 11, line 2:

The invention and the advantages which stem therefrom will become more apparent from the following illustrative examples supported by the appended Figure-4, which shows the reaction efficiency of the photocatalytic composition forming the subject of the invention.

Page 15: The fourth complete paragraph on page 15, beginning at line 20, as follows:

The appended Figure-4 shows the reaction efficiency obtained for photocatalytic  $\text{TiO}_2$  compositions coated in an amount of  $10 \text{ g/m}^2$  i.e., Examples 1A, 1B, 2A, 2A', 2B, 2B', 3B and 4B.

In the Claims:

1. **(Thrice Amended)** A photocatalytic composition comprising at least one photocatalyzing agent and an aqueous colloidal dispersion comprising from 20 to 50% by weight silica particles having a diameter of between 10 and ~~40~~ 50 nanometers and a specific surface area greater than  $80 \text{ m}^2/\text{g}$ , ~~said silica particles being capable of bonding together after having coated the photocatalyzing agent.~~

2. **(Twice Amended)** The photocatalytic composition as claimed in claim 1, wherein the ~~binding agent~~ aqueous colloidal dispersion consists essentially of an aqueous colloidal dispersion of silica.

4. **(Twice Amended)** The photocatalytic composition as claimed in claim 3, wherein the diameter of the  $\text{TiO}_2$  particles of the anatase  $\text{TiO}_2$  is between 10 and 30 nanometers.

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5. **(Twice Amended)** The photocatalytic composition as claimed in claim 3, comprising from 10 to 60 parts ~~(as dry matter)~~ of the aqueous colloidal dispersion ~~of silica as dry matter~~, as dry matter, a the balance to 100 parts consisting of  $\text{TiO}_2$ .

6. **(Twice Amended)** The photocatalytic composition as claimed in claim 5, comprising 50 parts of titanium dioxide and 50 parts of the aqueous colloidal dispersion ~~of silica~~.

7. **(Twice Amended)** The photocatalytic composition according to claim 1, additionally comprising zeolites modified by metal ions ~~capable of preventing the development of undesirable microorganisms and fungi~~.

9. **(Twice Amended)** A process for manufacturing a photocatalytic composition as claimed in claim 1, comprising mixing the photocatalyzing agent into the ~~inorganic binder~~ aqueous colloidal dispersion while stirring until a homogeneous suspension is obtained.

10. **(Twice Amended)** A process for manufacturing a photocatalytic composition as claimed in claim 7, comprising mixing the photocatalyzing agent and the zeolites modified by metal ions while stirring into the ~~inorganic binder~~ aqueous colloidal dispersion until a homogeneous suspension is obtained.